

Hot Gas TVC For Planetary Ascent Vehicle, Phase II

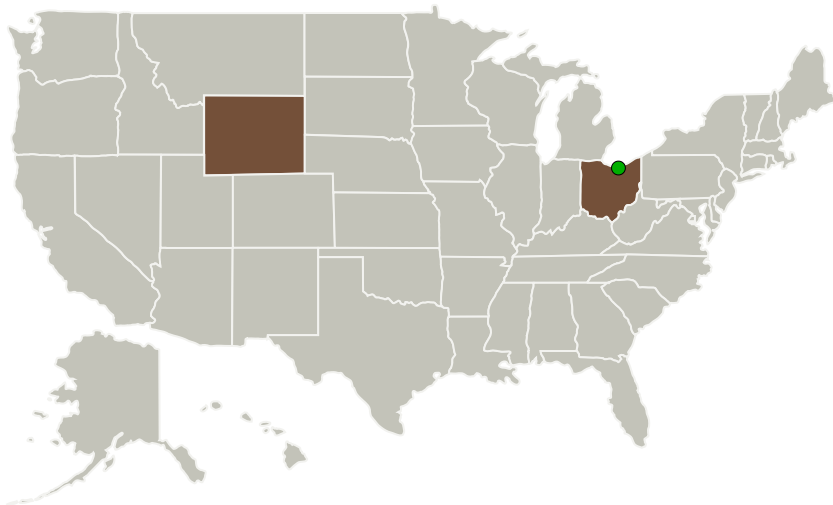
Completed Technology Project (2011 - 2013)



Project Introduction

A Mars ascent vehicle (MAV) uses solid rocket motors to propel soil samples into orbit, but the motors cannot provide steering. Flexseal TVC control is planned for the first stage while hydrazine thrusters will be used for spin stabilization of the second stage. This approach is heavy and results in a spinning sample container in orbit, which is difficult to recover. Wickman Spacecraft & Propulsion Company (WSPC) proposes innovative hot gas thrusters for steering that use the gases from the solid rocket combustion chambers. This approach is lighter, improves orbit insertion accuracy and provides a non-spinning orbiting container to increase mission success probability. The MAV valves must handle metalized gases at 3,093 C. During Phase I, WSPC demonstrated a hot gas valve operating above 3,093 C with the same propellant to be used in MAV. Valves from all other companies must operate at 2,760 C or below with little metal in the exhaust gas. During Phase II, WSPC will demonstrate a MAV first stage thruster and multiple MAV first stage thrusters operating from a single solid rocket motor using MAV solid propellant. This final demonstration test will simulate a typical MAV first stage TVC duty cycle.

Primary U.S. Work Locations and Key Partners



Hot Gas TVC For Planetary
Ascent Vehicle, Phase II

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Hot Gas TVC For Planetary Ascent Vehicle, Phase II

Completed Technology Project (2011 - 2013)



Organizations Performing Work	Role	Type	Location
Wickman Spacecraft & Propulsion Co.	Lead Organization	Industry	Casper, Wyoming
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Wyoming

Project Transitions

**June 2011:** Project Start**June 2013:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138957>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Wickman Spacecraft & Propulsion Co.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John H Wickman

Co-Investigator:

John Wickman

Hot Gas TVC For Planetary Ascent Vehicle, Phase II

Completed Technology Project (2011 - 2013)



Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System